

Cash Flow Forecasting:

A Tool for Portfolio Management

September 13, 2006

CDIAC Workshop

Ned Connolly, CCM



Overriding Objectives of Governmental Investment Management

- ***Safety***—maintain appropriate level of exposure to risk
- ***Liquidity***
 - Sufficient short-term investments
 - Marketable securities
 - Targeted maturities
 - Extra layer
- ***Yield (Return, Growth)***
 - Income
 - Long-term growth



Portfolio Management /s Risk Management

- The greater an investor's exposure to properly diversified risk, the higher the expected return over time.
- The greater an investor's exposure to risk, the higher will be the volatility of return from period to period.
- The objective of "safety" requires establishing risk constraints.



Identifying Portfolio Risks

- Market Risk
- Liquidity risk
- Reinvestment risk (Callables)
- Credit Risk (Non-governmental Issuers)
- Other—political, job, etc.



Exposure to Interest Rate Fluctuations—Market Risk

- Market risk
 - Securities prices change as interest rates change—in the opposite direction
 - Market risk is best measured as *modified duration*
 - Measure *effective duration* instead when securities have a call feature



What Is Duration, Anyway?

- Modified duration measures the percent change in price of a security for a 1 percent change in yields.
- Since market prices decline when yields rise, and rise when yields decline, duration is multiplied by -1 and then multiplied by the change in yield.
- We can't predict interest rates, but, using duration, we can calculate approximately how much the portfolio market value will change with a given, instantaneous change in interest rates



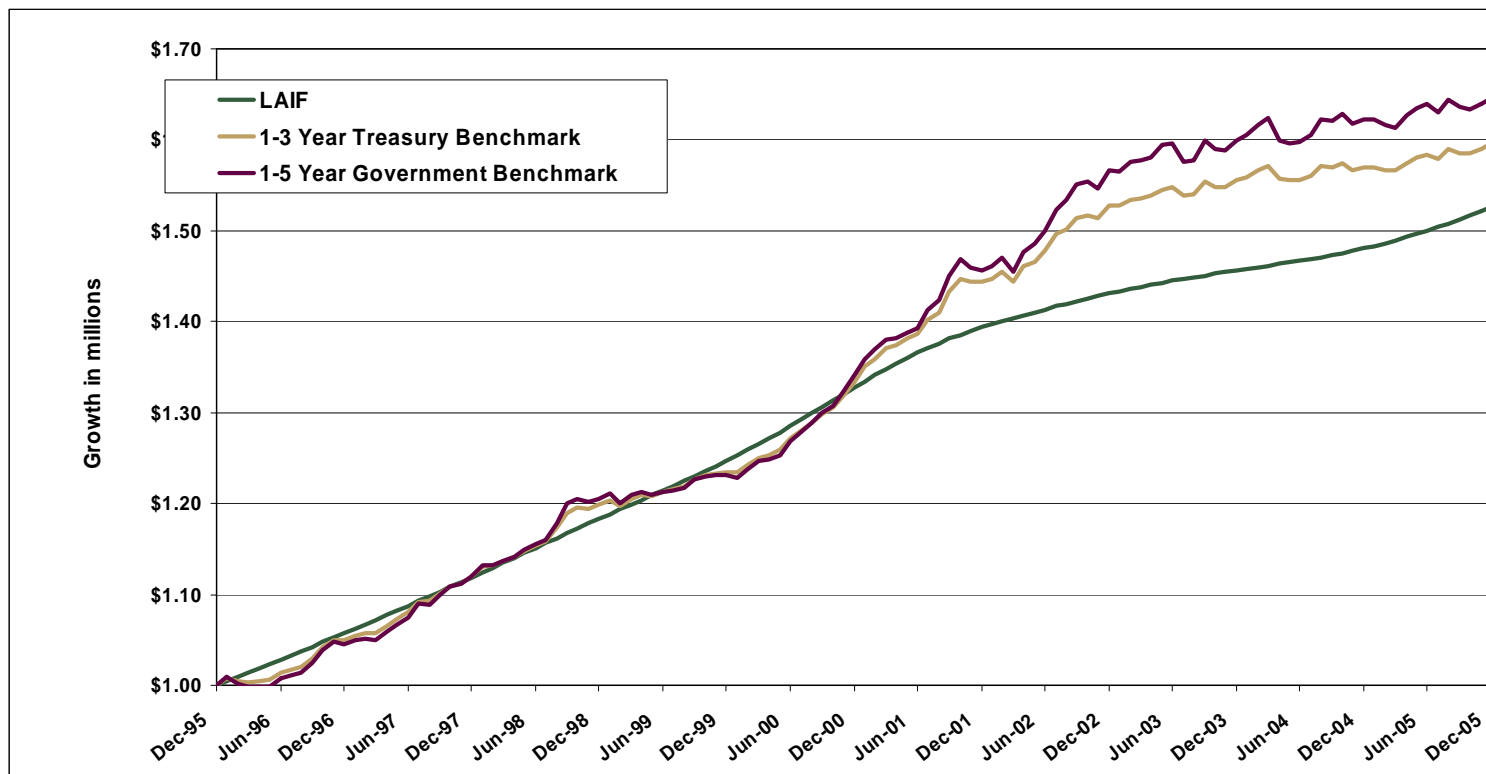
What Is Duration, Anyway?

- **Portfolio size = \$50 million**
- Portfolio duration = 2
- Interest rate $\Delta = +2.25\%$
- Portfolio MV $\Delta = \$50 \text{ million} \times 2 \times 2.25\% \times -1 = \$50 \text{ million} \times -4.5\%$
- **MV $\Delta = (\$2,250,000)$**
- Interest rate $\Delta = -2.25\%$
- Portfolio MV $\Delta = \$50 \text{ million} \times 2 \times (2.25\%) \times -1 = \$50 \text{ million} \times +4.5\%$
- **MV $\Delta = +\$2,250,000$**

- **Portfolio size = \$50 million**
- Portfolio duration = 1
- Interest rate $\Delta = +2.25\%$
- Portfolio MV $\Delta = \$50 \text{ million} \times 1 \times 2.25\% \times -1 = \$50 \text{ million} \times -2.25\%$
- **MV $\Delta = (\$1,125,000)$**
- Interest rate $\Delta = -2.25\%$
- Portfolio MV $\Delta = \$50 \text{ million} \times 1 \times (2.25\%) \times -1 = \$50 \text{ million} \times +2.25\%$
- **MV $\Delta = +\$1,125,000$**

Greater Exposure to Market Risk Lead, Greater Return Over Time

Higher Duration Portfolios Offer Greater Returns Over Time



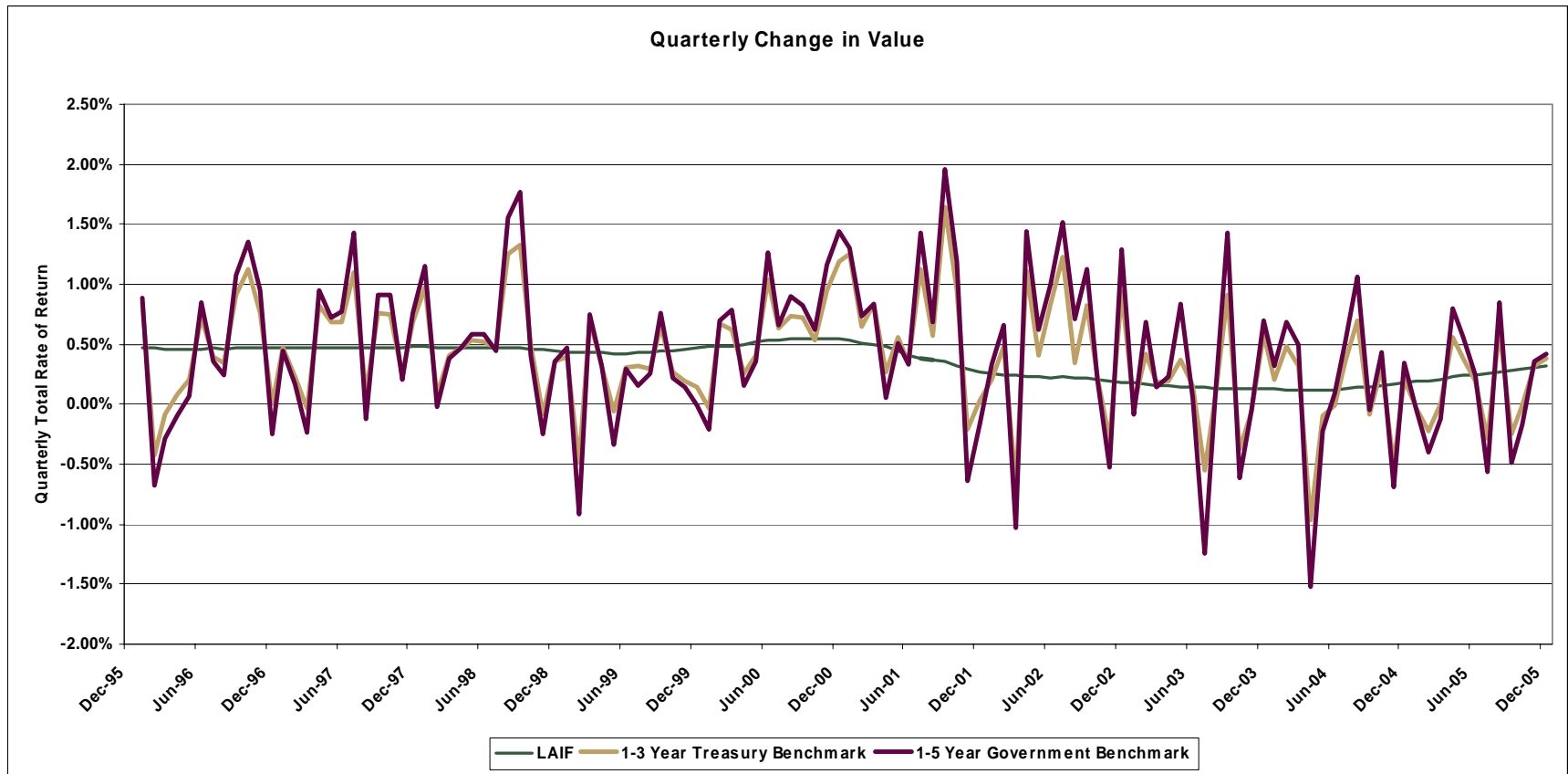
Source: Index return information provided by Merrill Lynch

Value on 12/31/2005 of \$1 million invested 12/31/1995		
	12/31/2005	Annualized Return
LAIF	\$1,525,924	4.32%
1-3 Year Treasury Benchmark	\$1,596,461	4.79%
1-5 Year Government Benchmark	\$1,646,268	5.11%



Greater Exposure to Market Risk Means Higher Volatility

Higher Duration Portfolios Have Greater Volatility of Return



LAIF is a LGIP managed by the California State Treasurer for California local agencies which invests primarily in short-term securities and seeks to pay \$1 dollar out for every \$1 dollar invested. The 1-3 Year and the 1-5 Year benchmarks are unmanaged index portfolios with durations of ____ and ____ respectively as of 12/31/05.



Choosing the Portfolio's Target Duration

- Some considerations regarding exposure to market risk
 - Short-term investments sufficient to meet cash needs
 - Agency need for portfolio income and growth
 - Agency appetite for market value fluctuations (GASB 40 considerations)
 - If actively managed, current market conditions
 - If actively managed, ability to realize losses
 - Statutory and policy considerations



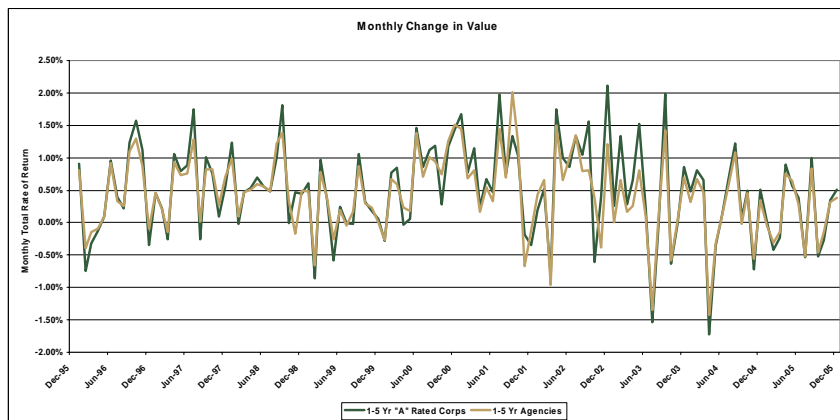
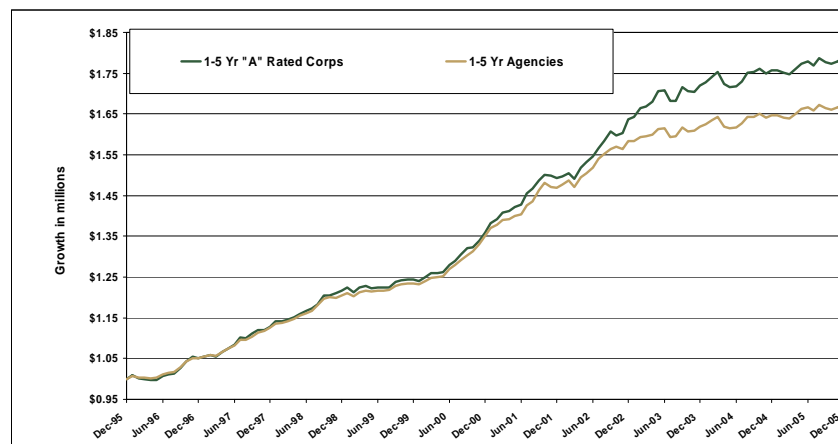
Credit Risk - Exposure to Non-Governmental Issuers

- Investors receive higher yields when they purchase securities from lower rated issuers
 - Agencies vs. Treasuries
 - Corporates vs. Agencies
 - “A” vs. AAA
- Credit ratings change over time
- Yield spreads among different quality sectors vary over time



Credit Risk - The Opportunity

- Assuming additional credit risk should result in higher returns over time



- With a similar pattern of volatility of return



- Assuming credit risk requires that additional resources be devoted to the investment program
 - Moody's/S&P ratings, watch lists, outlook
 - At time of purchase and
 - On a regular basis
 - Supplemented by
 - Third party sources
 - Internally generated credit research



- Liquidity risk (2 definitions)
 1. The risk that the portfolio won't provide adequate cashflow for the agency
 2. The risk that a security can't be sold, if necessary, at a good price
 - Measured by such factors as the difference between bid and ask
 - Number of market makers for the issue

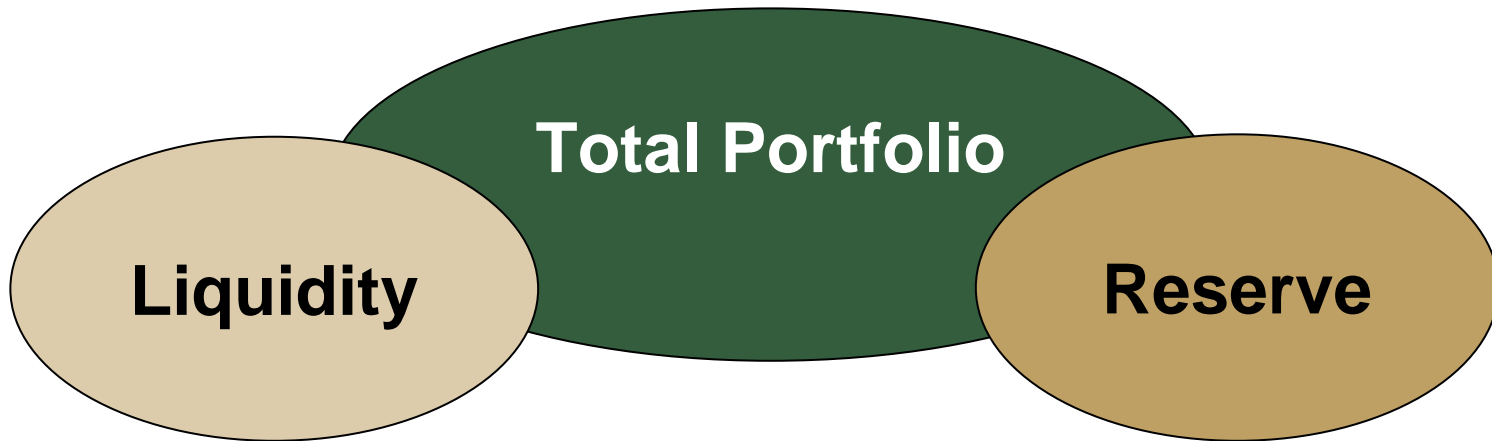


Definition 1

- Determine short-term investment needs through cash flow forecasting and other techniques
 - Use longer-term investments only for “reserves”
 - Avoid selling securities in order to raise funds for cash flow
-

Definition 2

- If active management is used for “reserves”, consider using more liquid issues—treasuries, larger size agency and corporate issues for part of the portfolio



■ ***Liquidity Component***

- Meets specific liquidity needs
- Invests in short-term securities
- Average maturity short
- Very low volatility
- Cash flow matching
- Investment pools and money market funds

■ ***Reserve Component***

- Targeted to highest suitable duration
- Longer-term securities
- Credit/reinvestment risk exposures?
- Normally not used for liquidity, but invested in highly marketable securities, in case
- Greater volatility



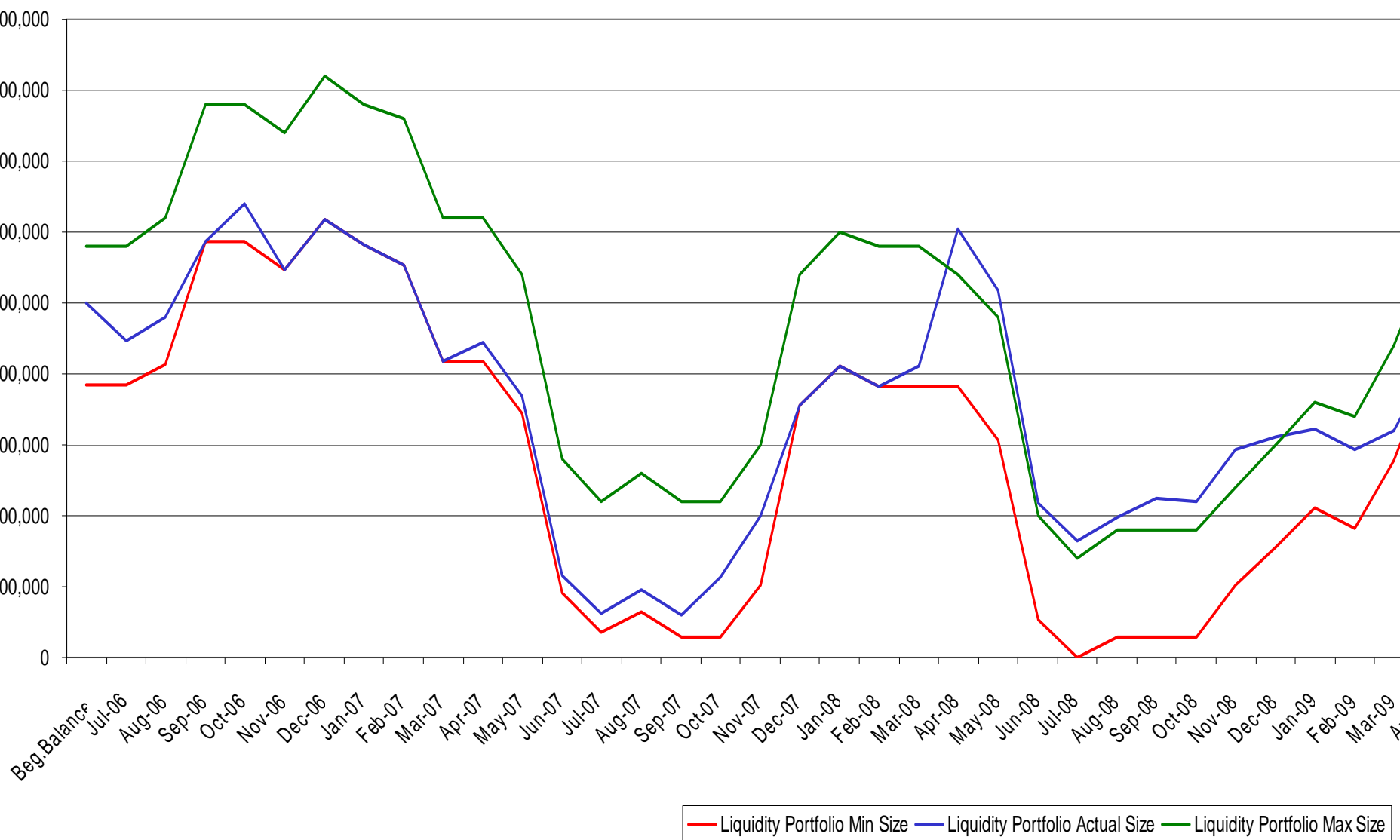
Determining Size of Liquidity Portfolio

City of , California Cash Flow Projections - All Funds

	6/30/06									
	Beg.Balance	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07
Fund Balances	101,955,000									
Annual Cash Flow										
Sales Tax Collections		7,600,000	7,600,000	7,600,000	7,600,000	7,600,000	7,600,000	7,600,000	7,600,000	7,600,000
Property Tax Collections		200,000	800,000	3,900,000	1,300,000	3,000,000	1,400,000	3,400,000	0	0
Airport Revenues		1,680,000	1,680,000	1,680,000	1,680,000	1,680,000	1,700,000	1,700,000	1,680,000	1,680,000
Other Revenues		10,480,000	10,480,000	10,480,000	10,480,000	10,480,000	10,480,000	10,480,000	10,480,000	10,480,000
Payroll and Benefits		(13,030,000)	(8,690,000)	(8,690,000)	(8,690,000)	(18,690,000)	(18,690,000)	(18,030,000)	(8,690,000)	(18,690,000)
Accounts Payable		(8,100,000)	(8,100,000)	(8,200,000)	(8,100,000)	(8,100,000)	(8,100,000)	(8,100,000)	(8,100,000)	(8,100,000)
Airport Expenditures		(1,550,000)	(1,570,000)	(1,570,000)	(1,570,000)	(1,570,000)	(1,570,000)	(1,570,000)	(1,570,000)	(1,570,000)
Debt Service		0	(521,000)	0	0	(34,000)	(1,914,000)	0	(2,833,000)	0
Take-out		0	0	0	0	0	0	0	0	0
Projected Net Change		(2,720,000)	1,679,000	5,200,000	2,700,000	(5,634,000)	(9,094,000)	(4,520,000)	(1,433,000)	(8,600,000)
In Flows		19,960,000	20,560,000	23,660,000	21,060,000	22,760,000	21,180,000	23,180,000	19,760,000	19,760,000
Out Flows		22,680,000	18,881,000	18,460,000	18,360,000	28,394,000	30,274,000	27,700,000	21,193,000	28,360,000
Portfolio Income&Maturity		0	0	0	0	0	0	0	0	0
Projected Balance	101,955,000	99,235,000	100,914,000	106,114,000	108,814,000	103,180,000	94,086,000	89,566,000	88,133,000	79,533,000
Customer Min. Comfort Level										
\$0										
High Low Method Min,Target,Max Cushsion										
Starting Bal		(9,094,000)	20,681,000	29,281,000	29,281,000	27,376,000	30,941,000	29,141,000	27,708,000	20,908,000
Liquidity Portfolio Min Size	19,248,000	19,248,000	20,681,000	29,281,000	29,281,000	27,376,000	30,941,000	29,141,000	27,708,000	20,908,000
Liquidity Portfolio Actual Size	25,000,000	22,280,000	23,959,000	29,281,000	31,981,000	27,376,000	30,941,000	29,141,000	27,708,000	20,908,000
Liquidity Portfolio Max Size	29,000,000	29,000,000	31,000,000	39,000,000	39,000,000	37,000,000	41,000,000	39,000,000	38,000,000	31,000,000
Net Flows from/to Liquidity Account			\$122,000		\$1,029,000	\$12,659,000	\$2,720,000		\$1,800,000	
Forward Looking Standard Deviator	9.79%	9.79%	10.99%	10.22%	8.36%	7.65%	8.94%	7.91%	8.40%	8.84%



Liquidity Portfolio Bands – Maximum, Minimum, Actual





Some Key Assumptions Behind the Model

- “Looks forward” 6 months in making minimum/maximum estimates
 - Satisfying requirements of liquidity to cover 6-months of cash flows
- Minimum Liquidity Portfolio (LP) = sum of 6-month outflows
 - Inflows not considered for minimum since less certain; more conservative approach
- $\text{Maximum LP} = \text{Minimum} + (2 \times \text{Standard Deviation for remaining period})$
- $\text{Beginning Target LP} = (\text{Min} + \text{Max})/2 = \text{approx. } 1 \text{ Standard Deviation}$
- $\text{Actual LP} = \text{Prior Month Value} \pm \text{Net Change for Month}$
- Test for Actual LP
 1. If exceeds Maximum by more than 0.5 St. Dev., sufficient funds transferred to Reserve Portfolio to make $\text{LP} = \text{Maximum} + 0.5 \text{ St. Dev.}$ (conservative and could be adjusted depending on confidence in overall cash flow projections)
 2. LP = at least the Minimum; if under, it draws funds from the Reserve Portfolio



Benefits of this Model

- Assures sufficient liquidity for 6 months forward
- Conservative assumptions
- Provides sufficient cushion throughout for the *unexpected*
- Safeguards against over-funding Liquidity Portfolio
- Funds not needed for Liquidity Portfolio can be invested in a Reserve Portfolio
 - Reserve Portfolio investment style can have greater diversified risk determined by policy constraints and risk tolerances
 - Greater diversified risk results in greater potential to maximize return